

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

RECEIVED

NOV 18 1987

Federal Communications Commission
Office of the Secretary

In the Matter of)
)
Advanced Television Systems)
and Their Impact on the)
Existing Television Broadcast)
Service)
)
Review of Technical and)
Operational Requirements:)
Part 73-E, Television Broadcast)
Stations)
)
Reevaluation of the UHF Television)
Channel and Distance Separation)
Requirements of Part 73 of the)
Commission's Rules)

MM Docket No. 87-268

COMMENTS OF THE NATIONAL CABLE TELEVISION ASSOCIATION, INC.

Wendell H. Bailey
Vice President
Science and Technology

R. Brian James
Director of Engineering
Science and Technology

Brenda L. Fox
Loretta P. Polk
1724 Massachusetts Ave., NW
Washington, D.C. 20036
(202) 775-3664

Counsel for National Cable
Television Association, Inc.

November 18, 1987

0710

TABLE OF CONTENTS

	<u>PAGE</u>
SUMMARY	iii
I. THE COMMISSION SHOULD NOT ACT PREMATURELY OR FROM TOO LIMITED A FRAMEWORK IN ADOPTING ATV SYSTEM STANDARDS GIVEN THE COMPLEX ISSUES THAT STILL NEED TO BE ADDRESSED	4
A. HDTV Systems Are Still Largely In The Developmental Stage	4
B. HDTV Standards May Need To Be Adaptable To Multiple Transmission And Display Modes	7
C. HDTV Systems Present A Different Set Of Attributes That Will Need To Be Compared And Evaluated	9
II. THE GOVERNMENT SHOULD PERMIT THE INDUSTRY-WIDE HDTV TECHNICAL AND POLICY COMMITTEES TO CONTINUE GATHERING THE NECESSARY DATA ON TRANSMISSION STANDARDS BEFORE TAKING ACTION	11
A. ATSC	12
B. HDTV Engineering Subcommittee	13
CONCLUSION	15

SUMMARY

Advanced television systems (ATV), particularly high definition systems, have the capacity to transform television into an entirely new viewing experience. The vastly improved picture and sound quality offered by these systems will enhance television programming far into the next century. In an attempt to make advanced television a reality for the American public, the Commission has embarked on this inquiry into the technical and public policy issues surrounding the use of ATV technologies by broadcast licensees.

Yet, "television", as we know it today and as it will undoubtedly exist in the future, is far more than conventional broadcast service. It comprises a broad and technologically diverse range of distribution media. Thus, in analyzing ATV technologies, and in considering the possible adoption of ATV standards, the Commission should look beyond purely broadcast issues.

The task for providers of television services, supported by the Commission, is to identify the particular combination of attributes and qualities of ATV that are most desirable and to develop ways to insure its availability to the American consumer. Because each delivery medium possesses different characteristics that may impact on its ability to transmit ATV programming to consumers, we cannot rush ahead in one direction until adequate data is gathered on all the media. While it is certainly possible that a single standard could emerge that optimizes the needs of broadcasters, cable operators and other media, it may be

necessary that, in order to best serve consumers each distribution medium will need to deliver ATV in a way that is optimal for that medium.

NCTA, therefore, urges the Commission to adopt a more comprehensive approach to the development of ATV systems -- one that focuses not only on broadcasting but also on the potential of cable and other media -- and to permit the industry-wide committees to continue their research and development work. For in selecting among the various technologies and standards to achieve advanced television, the government will literally be determining the face of television for generations of viewers.

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

RECEIVED

NOV 18 1987

Federal Communications Commission
Office of the Secretary

In the Matter of)
)
Advanced Television Systems)
and Their Impact on the)
Existing Television Broadcast)
Service)
)
Review of Technical and)
Operational Requirements:)
Part 73-E, Television Broadcast)
Stations)
)
Reevaluation of the UHF Television)
Channel and Distance Separation)
Requirements of Part 73 of the)
Commission's Rules)

MM Docket No. 87-268 /

COMMENTS OF THE NATIONAL CABLE TELEVISION ASSOCIATION, INC.

The National Cable Television Association, Inc. ("NCTA"), by its attorneys, hereby submits its comments in response to the Notice of Inquiry ("NOI") in the above-captioned proceeding. NCTA is the principal trade association of the cable television industry in the United States, representing owners and operators of cable television systems serving over 80 percent of the nation's 43 million cable homes. Its members also include cable programmers and cable equipment manufacturers.

With the on-going development of advanced television ("ATV") systems, the United States truly stands at the threshold of a revolution in television service. High definition television ("HDTV") in particular represents a technological innovation unmatched since the introduction of color television. It

promises viewing experiences of a clarity and realism that until now has only been available in large screen viewing of 35mm films, coupled with vastly improved sound capabilities. HDTV, quite simply, is the future of television.^{1/}

In pursuit of an advanced television future for the American public, the Commission has initiated this "wide-ranging inquiry to consider the technical and public policy issues surrounding the use of advanced television technologies by television broadcast licensees." While NCTA commends the Commission's recognition of the enormous importance of these new technologies, we submit that the implications of ATV systems for conventional broadcast television is only part of the ATV equation. Television, today, encompasses more than just over-the-air broadcasting; American consumers now receive television programming via cable, microwave, satellite-delivered services and video cassettes. Cable television is now the primary delivery system in at least 50 percent of American homes and is available to 80 percent of the television households.

1/ The Commission broadly defines "advanced television systems" as encompassing "any system(s) that improves television audio and video quality or enhances in any way the current NTSC system..." See NOI at para. 19. High definition television is that subgroup of advanced television systems that generally doubles the vertical and horizontal resolution or detail of the current NTSC standard, improves color fidelity, widens the screen by one-third and improves the sound quality to the level of compact discs. NCTA's comments in this proceeding focus primarily on these high definition systems. Therefore, when the term "advanced television system" is used in the comments, we generally mean high definition television.

Thus, inquiries into the future shape of television must not overlook the near majority of the population that receives television by means other than broadcasting. This is particularly important given the Commission's long-standing policy that the public interest is best served by the availability of diverse program sources and video distribution outlets.^{2/} NCTA, therefore, urges the Commission, in considering ATV policies and standards, not to dismiss other equally important and potentially more capable delivery systems in an effort to accommodate broadcast needs. Bringing the full benefits of ATV systems to the American consumer will require thoughtful analysis of the characteristics of all delivery media.

Recognizing that high definition systems will profoundly enhance television quality for cable subscribers, NCTA is committed to the orderly and successful development of these systems. In that regard, NCTA has already allocated substantial resources to this project. A "blue ribbon" committee has been created to consider the policy and practical ramifications involved in the development of high definition television from the cable industry's perspective. The committee, which will be advised by a group of technical experts in the industry, is comprised of top executive officers from cable systems, cable programmers, consumer product manufacturers and cable equipment suppliers. In addition, as will be discussed more fully below,

2/ See, e.g., Amendment of Part 76 of the Commission's Rules Concerning Carriage of Television Broadcast Signals by Cable Television Systems, Report and Order, 1 FCC Rcd. 864 (1986).

NCTA also established an HDTV subcommittee of its engineering committee (which had begun work on HDTV matters over two years ago) to, inter alia, evaluate the cable-specific aspects of proposed transmission systems.

The cable industry, through NCTA and several major cable companies, has also taken an active role in the creation and on-going activities of the Advanced Television Systems Committee ("ATSC") which represents all facets of the American television industry in the coordination of industry-wide voluntary technical standards for ATV systems. NCTA believes that such cooperative, industry-wide organizations are necessary to achieve the best ATV system or systems for the viewing public.

I. THE COMMISSION SHOULD NOT ACT PREMATURELY OR FROM TOO LIMITED A FRAMEWORK IN ADOPTING ATV SYSTEM STANDARDS GIVEN THE COMPLEX ISSUES THAT STILL NEED TO BE ADDRESSED.

A. HDTV Systems Are Still Largely In The Developmental Stage.

As described in the NOI, advanced television systems comprise a broad range of different technologies designed to improve significantly upon television picture and sound quality. These enhanced systems include both improved NTSC systems and the more advanced high definition systems. Improvements to the NTSC standard, which generally require no incompatible changes to the existing standard or increase in bandwidth, have occurred throughout its near 50-year history. While further NTSC improvements are still under development, recent attention has been directed at the more complex high resolution advanced television systems. These high definition systems, which offer a

major leap in television quality, are generally characterized by having at least twice the horizontal and vertical resolution of current television pictures; a broadening in the aspect ratio to at least 5:3; and the delivery of multiple-channel high fidelity sound.^{3/} As a general rule, improved resolution has required additional bandwidth for luminance and chrominance information. The Japanese Broadcasting Corporation (NHK), for example, developed an 1125 scan line/60 Hz field rate production standard for HDTV that occupies 30 MHz of bandwidth. This 1125/60 system has become the accepted production standard for North America.

Each of the proposed HDTV transmission systems utilize different amounts of spectrum and different techniques to transmit (and receive) the critical elements of the HDTV signal. Two such systems, the North American Phillips system and the New York Institute of Technology system (developed by Dr. William Glenn), utilize two channels to create a high resolution picture. One channel contains the NTSC-compatible signal while a second augmentation channel carries the additional video information necessary to display an HDTV picture. Two other systems under development propose to produce a high resolution picture using only one 6 MHz channel for transmission. The Del Ray System, developed by Richard J. Iredale of the Del Ray Group, is designed to recreate images by working with encoding and sampling techniques to deliver more detail information within the 6 Mhz wide channel. NBC's proposed advanced compatible television

3/ This generic definition of HDTV was adopted by the ATSC's technology group on high definition television.

system, ACTV, would use a variety of techniques, such as progressive scanning and subcarriers to provide single-channel, extended definition, wide screen television.^{4/} Common among all of these proposals is an effort to remain compatible with existing NTSC television standards. The NHK, on the other hand, has approached HDTV from a different direction. Because it was designed to be compatible with the 1125/60 studio standard and is aimed at achieving a video quality almost equal to a 35mm motion picture, NHK developed the MUSE transmission system. MUSE uses bandwidth compression techniques to fit the HDTV studio signal into 8.1 MHz.^{5/}

While all of these systems look promising, it is difficult at this early stage, as the Commission has acknowledged, to compare the relative merits and disadvantages of the different strategies for delivering high definition television. None of the proposed systems except the NHK-Muse system is operational and even this system's application to cable and other delivery systems is still largely untested. Most of the other systems

4/ Some engineers have indicated skepticism that true HDTV can be compressed into the current 6 MHz bandwidth, although it is too early in the research to make a conclusive determination. Technically, NBC does not describe its proposal as HDTV but, rather, as an "advanced" NTSC-compatible system.

5/ As described in the NOI, other companies are developing HDTV transmission systems, including Bell Laboratories and CBS Inc. Scientific Atlanta is currently marketing the B-MAC system. See NOI at para. 27-38. Research into advanced television is also being conducted at the Massachusetts Institute of Technology under the auspices of the privately-funded Center for Advanced Television Studies. Home Box Office, Inc. and American Television and Communications Corporation are among the center's sponsoring organizations.

have not even reached the prototype stage. Thus, until further development and testing on various distribution media is completed, there is no basis for meaningful comparison and evaluation.

B. HDTV Standards May Need To Be Adaptable To Multiple Transmission And Display Modes.

To date, the focus of the discussion and analysis of the various transmission proposals has centered on the question of the amount of spectrum necessary to deliver an advanced NTSC or HDTV signal. Given the various systems under consideration, the challenge is to assess the ability of each technique actually to deliver the vastly improved imagery and sound capabilities achieved in the production studio. The particular characteristics of each delivery medium may be very significant in setting HDTV transmission standards.^{6/}

Since over-the-air broadcasters rely on spectrum bandwidth to deliver television signals, effective transmission of HDTV signals depends upon the availability of sufficient spectrum. If cable, on the other hand, is the transmission medium, the amount of spectrum to be used may be less critical.^{7/} For cable, the

6/ Based on NCTA's work with ATSC, there is general agreement among television engineers that a wide range of transmission standards could be applied to the studio production standard that would result in the delivery of high definition television to the home.

7/ Cable is theoretically capable of offering unlimited spectrum. As a practical matter, however, it too has capacity demands and current uses of space that would dictate costly upgrades if an ATV format that utilized excessive bandwidth were selected. In particular, if the
(Footnote continues on next page)

crucial concern is signal robustness: how a particular HDTV signal format will survive transmission over the environment attendant to the coaxial cable plant. Noise, echoes, ghosts, micro-reflections and other artifacts in cable transmissions are generally not observable by the untrained eye. However, once the clarity of HDTV programming is introduced into the system, many such imperfections may be intensified. Since each of the HDTV systems now under development may have a different impact on the special problems of cable transmission, it will be necessary to identify which technologies enable cable systems to pass a high quality signal. It may even turn out that none of the present proposals is adequate and that yet another transmission system needs to be developed.

Thus, before the Commission specifies a highly spectrum-efficient advanced NTSC or HDTV transmission standard suitable for the broadcast industry, it should ensure that the broadcast signal can be delivered over a cable system with minimal degradation. This is particularly an important consideration since half of the U.S. households receive broadcast signals via cable. At the same time, cable systems should not be constrained by a standard based on spectrum scarcity if cable systems can deliver a signal that is technologically superior utilizing a different transmission scheme. Each distribution medium should

(Footnote continued)

ATV broadcast standard requires additional spectrum, it will have definite must-carry ramifications for cable systems.

have the opportunity to maximize its delivery capabilities in order to serve its customers.

The possibility that transmission standards will vary may ultimately require that HDTV receivers be capable of recognizing different signal formats and converting them to appropriate display modes. Thus, the means of displaying high definition television in the home should also remain open to alternative designs at this juncture. A single transmission standard may be ideal in terms of economizing on home receiver costs. Adopting a single standard may, however, artificially foreclose the delivery and display of superior television images to consumers.

In light of the foregoing possibilities, the Commission should not preclude the development of multiple transmission and display modes by selecting a single standard at this early stage in HDTV development.

C. HDTV Systems Present A Different Set Of Attributes That Will Need To Be Compared And Evaluated.

Once the proposed HDTV systems reach the operational stage, evaluation can proceed on the basis of a variety of comparison criteria. The most obvious is technical performance. This would consist of objective and subjective testing of both video and audio quality, including lab and field tests of the technology's performance through various distribution systems.^{8/}

8/ Other significant comparison factors include costs, both consumer and industry implementation costs, spectrum efficiency and compatibility with encryption standards.

In addition to technical performance, another major factor to consider is compatibility with the NTSC standard.^{9/} As noted in the NOI, there are presently an estimated 130 million NTSC television receivers in U.S. households. There is little doubt that the introduction of an HDTV system which could not be viewed on a standard television set would create significant viewer dislocation. Thus, compatibility with NTSC is a desirable objective in easing the transition to HDTV.^{10/}

Nonetheless, in NCTA's present view, maintaining compatibility with NTSC is not essential if it means that true high definition television will be unavailable to the American public. In other words, some sacrifice of picture quality may be acceptable to maintain NTSC-compatibility but not at the expense of a truly high quality picture. Such action could stifle further research and development of HDTV systems.^{11/}

As each advanced television system undergoes a cost/benefit analysis based on various comparison criteria, an appropriate balance must be struck between television picture quality and

9/ Compatibility is defined as any ATV system that produces at least one part of its signal that can be received and displayed by a current NTSC standard television receiver without modification and minimum quality degradation.

10/ Indeed, NTSC-compatible systems could even promote viewer acceptance of HDTV since those watching the NTSC component of an HDTV signal are likely to be lured to obtain an HDTV receiver as a result of being constantly reminded of what they are missing. This was a major aspect of the growth of color television and stereo television.

11/ In the event that an incompatible system is recommended, provision must be made to ensure that spectrum is available to simulcast both HDTV and NTSC signals during the transition phase.

economic costs for the American consumer. While some trade-offs may have to be made, the point is that the analysis should not be driven exclusively by the needs of any particular medium. In any event, any determination that compatibility is necessary for the broadcast industry need not and ought not to dictate the characteristics of transmission systems appropriate for other media. The public deserves the best possible HDTV system which can be delivered to the home in the foreseeable future.

II. THE GOVERNMENT SHOULD PERMIT THE INDUSTRY-WIDE HDTV TECHNICAL AND POLICY COMMITTEES TO CONTINUE GATHERING THE NECESSARY DATA ON TRANSMISSION STANDARDS BEFORE TAKING ACTION.

Despite the complex questions that remain to be answered and the need to act cautiously in advanced television decision-making, this does not mean that the U.S. television industry should not aggressively seek to make HDTV a reality in the near future. In fact, the Japanese Broadcasting Company, which has already developed an HDTV system for satellite transmissions, is poised to introduce high definition VCRs to the U.S. market by 1990. Developers of other high definition systems must, therefore, push forward (where feasible) in the research and development of their systems in order to be competitive.

The government can assist in this process by creating an environment that maximizes the ability of all media to compete in the transmission of high quality images. The Commission should, therefore, permit the industry-wide technical committees, notably ATSC, and the technical and policy arms of particular industry organizations, to continue their study and assessment of ATV

systems before the Commission takes definitive action. With input from all facets of the television industry, the Commission can then oversee the adoption of voluntary, industry-recommended advanced television standards.^{12/}

In conjunction with ATSC and the HDTV Engineering subcommittee, NCTA has been studying HDTV and its application to cable television systems. NCTA is also prepared to coordinate with other appropriate mechanisms to accomplish the evolution to an HDTV environment.

The following is a description of the work in progress under the auspices of ATSC and NCTA.

A. ATSC

The majority of the work on the development of voluntary national standards for advanced television is being performed by the ATSC. Established in 1982, the Committee's charter members, in addition to NCTA, are the Electronic Industries Association (EIA), the Institute of Electrical and Electronic Engineers (IEEE), the National Association of Broadcasters (NAB) and The Society of Motion Picture and Television Engineers (SMPTE). Its membership is composed of terrestrial and satellite broadcasters, cable television operators, television equipment manufacturers,

^{12/} NCTA believes that the establishment of a set of standards through industry consensus is necessary in light of the experiences of AM stereo and television stereo. AM stereo has not achieved widespread acceptance largely because several different systems are still competing in the marketplace. Television stereo, on the other hand, has achieved much greater success because an industry-recommended standard was protected by the Commission.

research institutions and motion picture industry representatives.

The ATSC has created a technology subgroup to study high definition television.^{13/} In September 1986, the HDTV Technology Group appointed a Specialist Group on HDTV transmission and distribution to provide recommendations to ATSC regarding a single standard or family of standards for delivery of HDTV to the consumer. The Specialist Group is, among things, analyzing and testing the relevant characteristics of spectrum potentially available for the transmission of HDTV signals; developing test plans and criteria for evaluating HDTV system performances and conducting the tests; and analyzing technical feasibility and economic trade-offs of system implementation.

To date, the Specialist Group has focused on terrestrial broadcast television. The Group is now beginning to measure the propagation characteristics of signals on cable television systems in order to develop models suitable for evaluation of HDTV transmission systems. NCTA, which has an engineer assigned to the group, is actively participating in this work.

B. HDTV Engineering Subcommittee

As noted earlier, NCTA has set up its own engineering subcommittee to study HDTV technology. The subcommittee, which consists of leading engineers from the operating, programming and manufacturing sectors of the industry, will provide ATSC and

13/ There are also two other technology groups: improved NTSC and enhanced 525-Line Systems. The ATSC Executive Committee recently combined the activities of these committees.

others with the cable industry's perspective on the development of the HDTV transmission standard or standards. The major objectives of the NCTA HDTV subcommittee are (1) to determine the characteristics of the cable television plant, (2) to evaluate the cable aspects of each proposed transmission system, and (3) to select a particular transmission standard suitable for cable television.

The work of the subcommittee has been divided into two groups:

Group 1 is addressing the characterization of the signal distribution path which includes the satellite programming link, terrestrial microwave link, coaxial/fiber cable network and the in-home terminal device (channel converter and pay television decoder).

Group 2 serves as the liaison with the ATSC Specialist Group in communicating NCTA's findings on the characteristics of the cable distribution network. Group 2 is also charged with maintaining continual dialogue with HDTV system developers and equipment manufacturers regarding the special requirements of cable distribution.

To date, the HDTV subcommittee has participated in demonstrations of HDTV technologies, including the North American Phillips HD-NTSC system, the NBC ACTV system and the NHK-Muse system, and assisted in recent public demonstrations of HDTV in Canada and the U.S. The subcommittee also set up test procedures, which have been provided to ATSC, to determine the signal propagation characteristics of the entire cable network, including satellite links, microwave and cable distribution systems, and consumer equipment. The results of the data obtained will be used to create a computer simulation of the

cable system which can be used in determining the operating characteristics of proposed HDTV transmission systems. In addition, the ATSC Specialist Group will conduct subjective evaluation tests. While the work of these committees is still underway, it would be premature for the Commission to select any particular HDTV standard or standards.

CONCLUSION

Given the far-ranging impact that advanced television will have on the American public, the Commission should not only proceed cautiously, but should adopt a much wider view of the implications of these technologies for all of the interested distribution media, before it establishes new television standards.

Respectfully submitted,

NATIONAL CABLE TELEVISION
ASSOCIATION, INC.

Wendell H. Bailey /lpp
Wendell H. Bailey
Vice President
Science and Technology

By Brenda L. Fox /lpp
Brenda L. Fox

Brian James /lpp
R. Brian James
Director of Engineering
Science and Technology

By Loretta P. Polk
Loretta P. Polk

ITS ATTORNEYS

1724 Massachusetts Ave., N.W.
Washington, D.C. 20036
(202) 775-3664

November 18, 1987